# Sub Saharan Africa: livestock systems, demand and supply of livestock products and sources of GHG emissions

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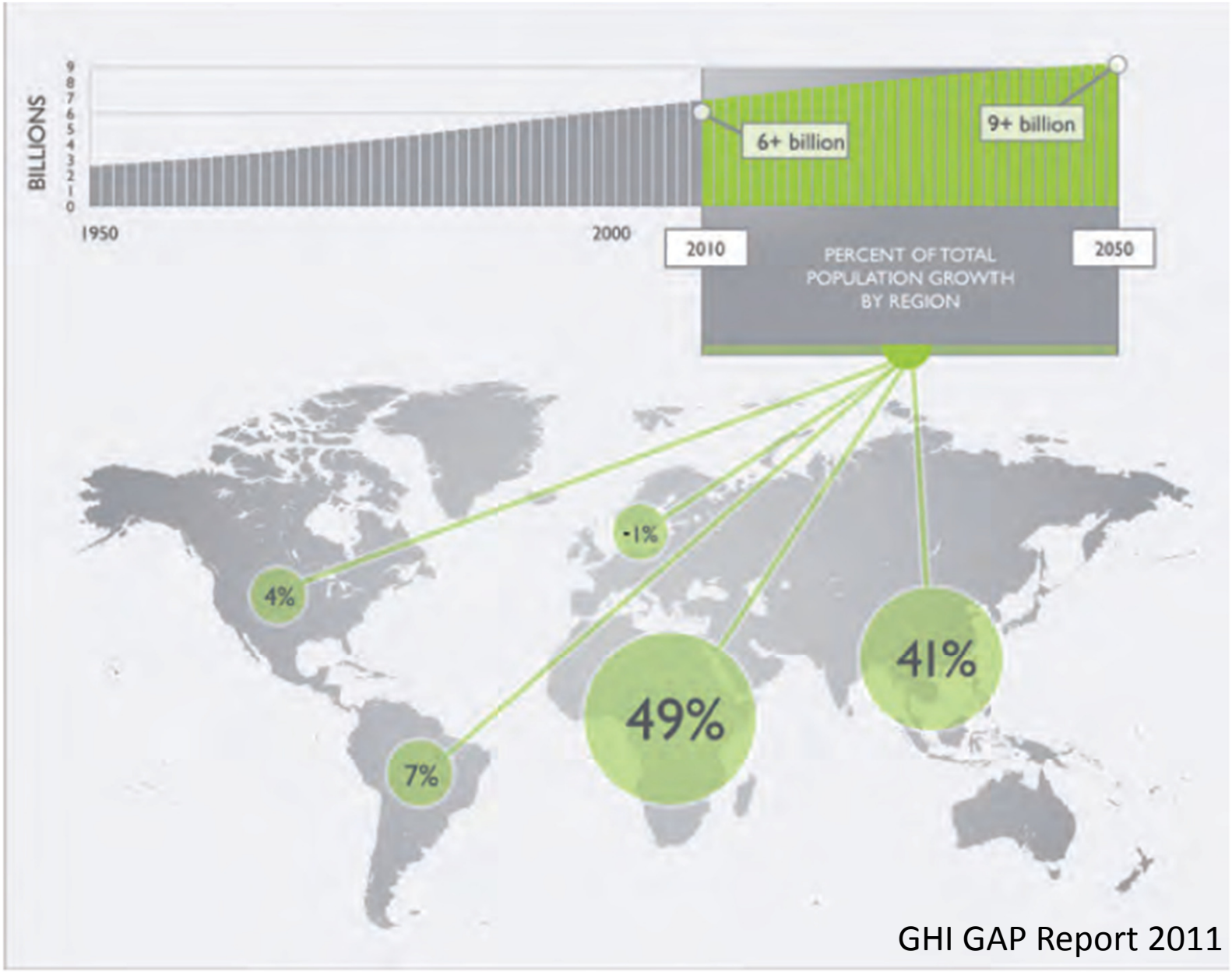
GRA-ILRI-CCAFS GHG emissions workshop
Nairobi 24-26 September 2012

# Background

- Dynamic region with significant growth in the last decades
- Livestock sector changing rapidly (both the demand and the supply)
- Need to understand production systems to construct GHG inventories
- Need to understand sources of emissions
- These are first steps towards designing mitigation strategies

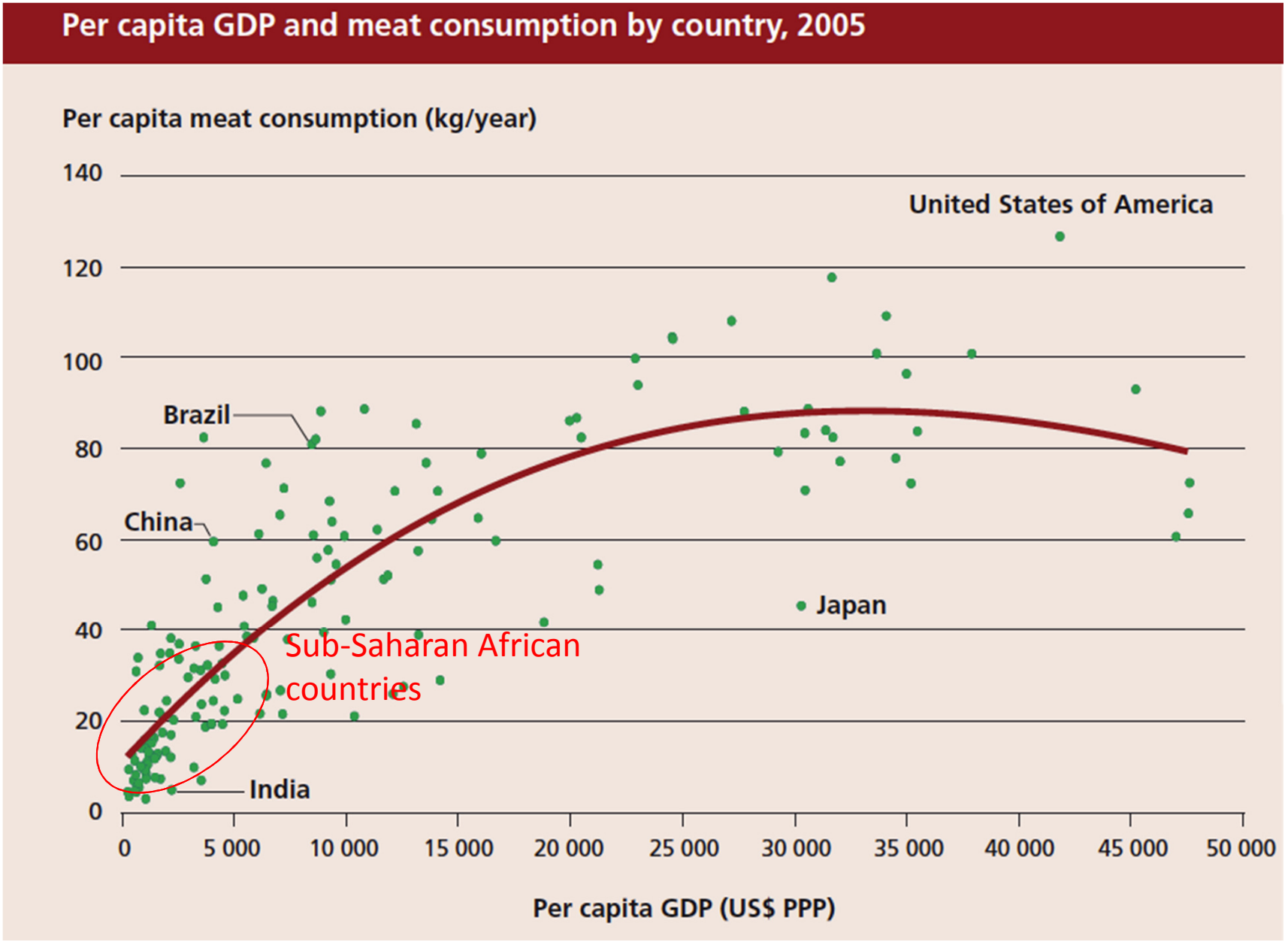
# The demand for livestock products
# Drivers and trends

# Population Growth




GHI GAP Report 2011

The ‘livestock revolution’: as people get richer they consume more meat



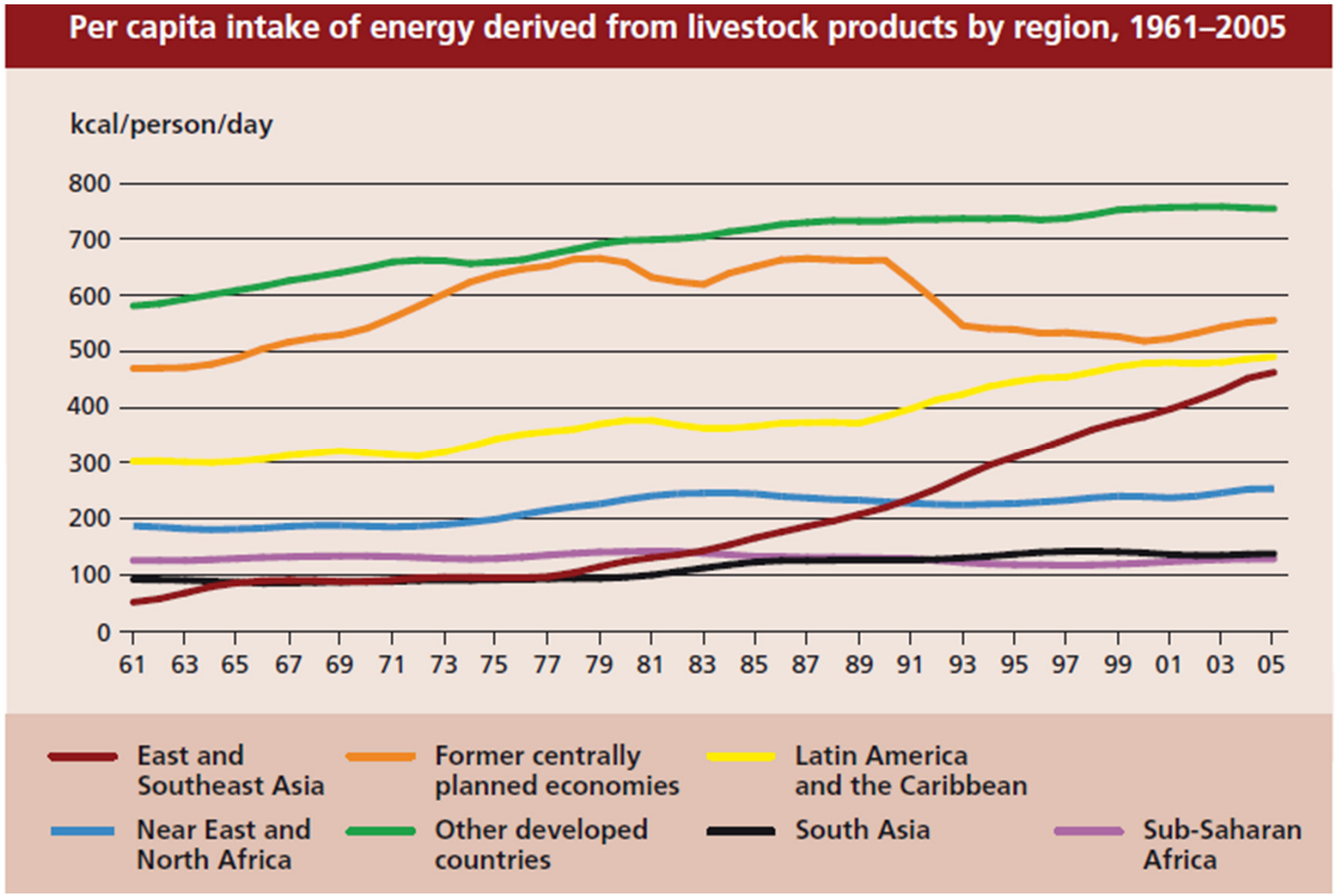
# Urbanization

# Meat consumption per capita stagnating in the last 25 years!

| REGION/COUNTRY GROUP/ COUNTRY | MEAT | | MILK | | EGGS | |
|---|---|---|---|---|---|---|
| | 1980 | 2005 | 1980 | 2005 | 1980 | 2005 |
| | *(kg/capita/year)* | | *(kg/capita/year)* | | *(kg/capita/year)* | |
| **DEVELOPED COUNTRIES** | **76.3** | **82.1** | **197.6** | **207.7** | **14.3** | **13.0** |
| **Former centrally planned economies** | 63.1 | 51.5 | 181.2 | 176.0 | 13.2 | 11.4 |
| **Other developed countries** | 82.4 | 95.8 | 205.3 | 221.8 | 14.8 | 13.8 |
| **DEVELOPING COUNTRIES** | **14.1** | **30.9** | **33.9** | **50.5** | **2.5** | **8.0** |
| **East and Southeast Asia** | 12.8 | 48.2 | 4.5 | 21.0 | 2.7 | 15.4 |
| China | 13.7 | 59.5 | 2.3 | 23.2 | 2.5 | 20.2 |
| Rest of East and Southeast Asia | 10.7 | 24.1 | 9.9 | 16.4 | 3.3 | 5.1 |
| **Latin America and the Caribbean** | 41.1 | 61.9 | 101.1 | 109.7 | 6.2 | 8.6 |
| Brazil | 41.0 | 80.8 | 85.9 | 120.8 | 5.6 | 6.8 |
| Rest of Latin America and the Caribbean | 41.1 | 52.4 | 109.0 | 104.1 | 6.5 | 9.4 |
| **South Asia** | 4.2 | 5.8 | 41.5 | 69.5 | 0.8 | 1.7 |
| India | 3.7 | 5.1 | 38.5 | 65.2 | 0.7 | 1.8 |
| Rest of South Asia | 5.7 | 8.0 | 52.0 | 83.1 | 0.9 | 1.5 |
| **Near East and North Africa** | 17.9 | 27.3 | 86.1 | 81.6 | 3.7 | 6.3 |
| **Sub-Saharan Africa** | 14.4 | 13.3 | 33.6 | 30.1 | 1.6 | 1.6 |
| **WORLD** | **30.0** | **41.2** | **75.7** | **82.1** | **5.5** | **9.0** |

*Source:* FAO, 2009b.

FAO: SOFA2009




FAO: SOFA2009

Sub-Saharan Africa: 8% of calories coming from livestock products

# The supply side: Livestock production Systems

# Production of livestock products by region 1990-2005

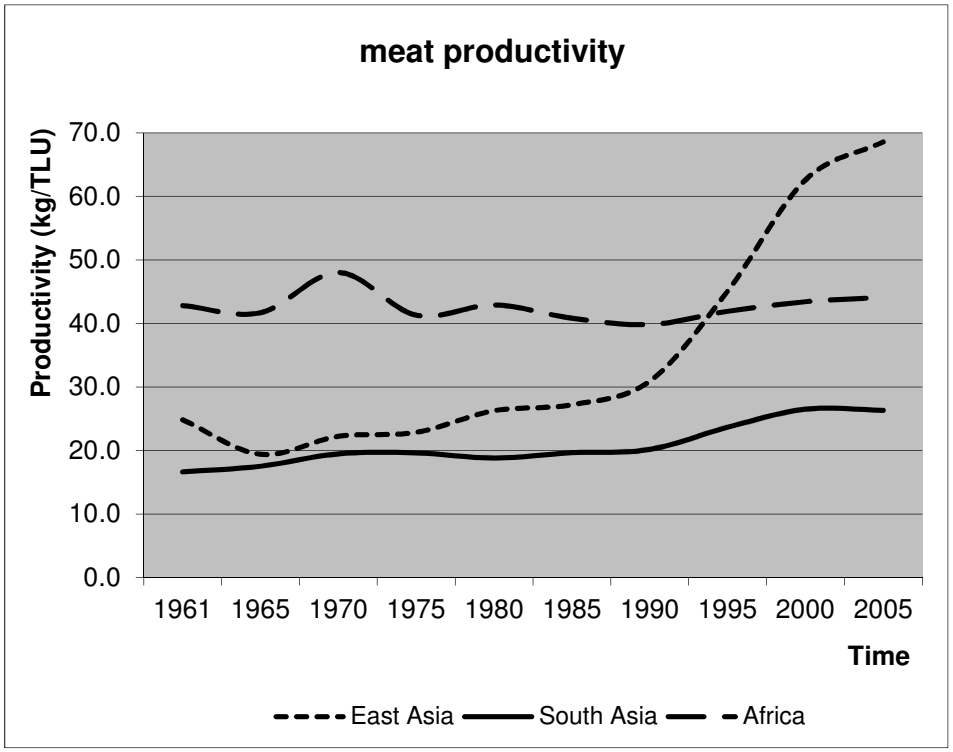
## Production of livestock products doubled!

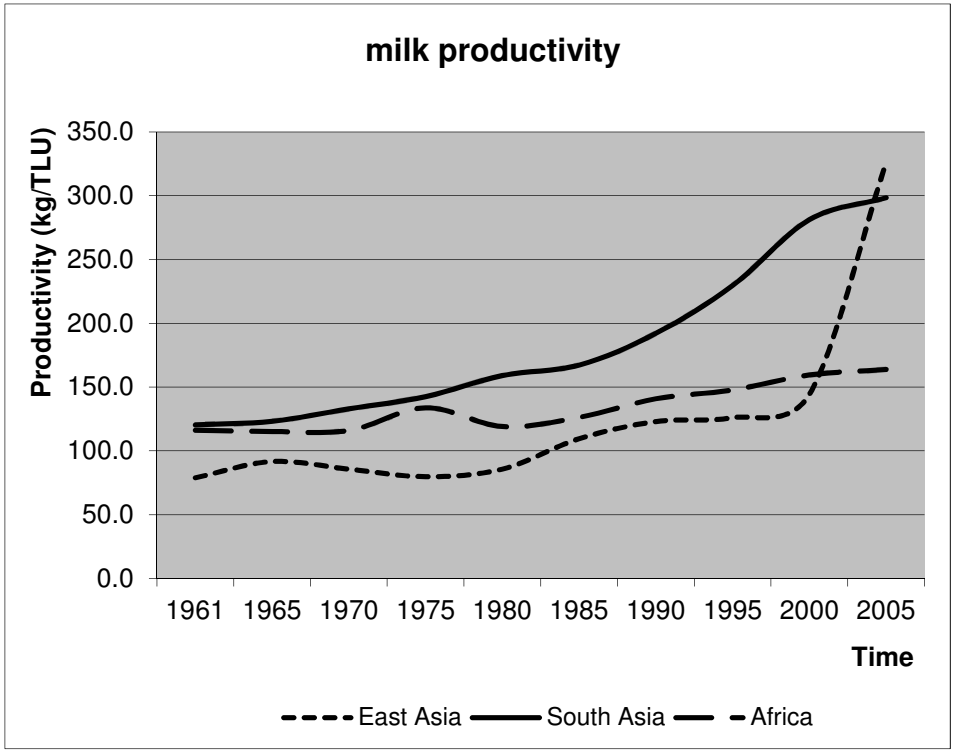
| REGION/COUNTRY GROUP/ COUNTRY | MEAT | | MILK | | EGGS | |
|---|---|---|---|---|---|---|
| | 1980 | 2007 | 1980 | 2007 | 1980 | 2007 |
| | *(Million tonnes)* | | *(Million tonnes)* | | *(Million tonnes)* | |
| **DEVELOPED COUNTRIES** | **88.6** | **110.2** | **350.6** | **357.8** | **17.9** | **18.9** |
| **Former centrally planned economies** | 24.6 | 19.0 | 127.3 | 101.5 | 5.6 | 5.1 |
| **Other developed countries** | 64.0 | 91.3 | 223.3 | 256.3 | 12.4 | 13.8 |
| **DEVELOPING COUNTRIES** | **48.1** | **175.5** | **114.9** | **313.5** | **9.5** | **48.9** |
| **East and Southeast Asia** | 19.4 | 106.2 | 4.4 | 42.9 | 4.5 | 34.6 |
| China | 13.6 | 88.7 | 2.9 | 36.8 | 2.8 | 30.1 |
| Rest of East and Southeast Asia | 5.6 | 17.5 | 1.5 | 6.1 | 1.7 | 4.5 |
| **Latin America and the Caribbean** | 15.7 | 40.3 | 35.0 | 68.7 | 2.6 | 6.3 |
| Brazil | 5.3 | 20.1 | 12.1 | 25.5 | 0.8 | 1.8 |
| Rest of Latin America and the Caribbean | 10.4 | 20.2 | 22.9 | 43.3 | 1.8 | 4.6 |
| **South Asia** | 3.7 | 9.4 | 42.7 | 140.6 | 0.8 | 3.4 |
| India | 2.6 | 6.3 | 31.6 | 102.9 | 0.6 | 2.7 |
| Rest of South Asia | 1.1 | 3.0 | 11.2 | 37.7 | 0.2 | 0.7 |
| **Near East and North Africa** | 3.4 | 9.7 | 19.3 | 36.4 | 0.9 | 3.0 |
| **Sub-Saharan Africa** | 5.5 | 9.3 | 12.9 | 24.3 | 0.7 | 1.5 |
| **WORLD** | **136.7** | **285.7** | **465.5** | **671.3** | **27.4** | **67.8** |

*Note:* Totals for developing countries and the world include a few countries not included in the regional aggregates.
*Source:* FAO, 2009b.

SOFA2009

# But livestock productivity stagnating…

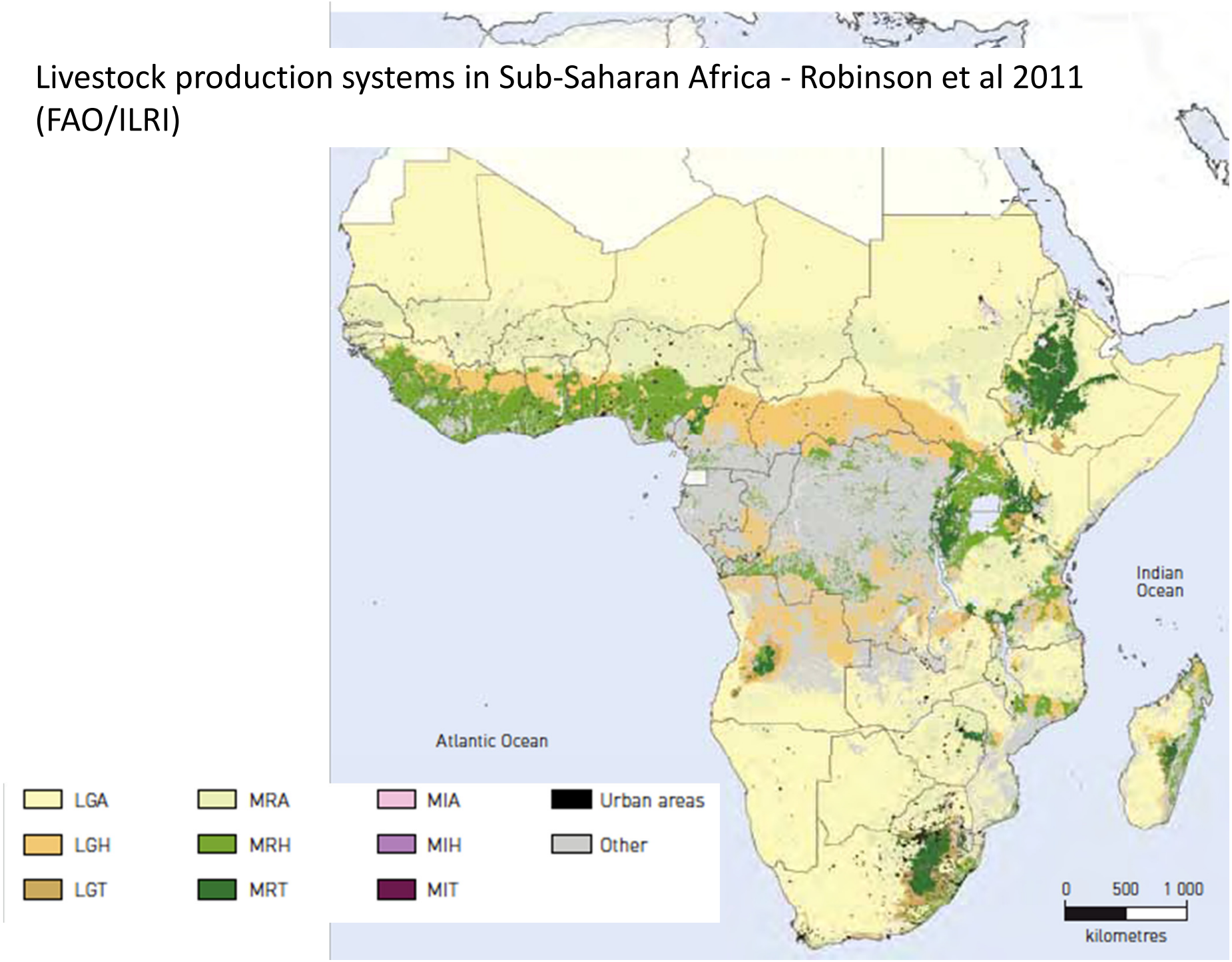



Huge resource use implications!


Wide range of
production systems

Livestock production systems in Sub-Saharan Africa - Robinson et al 2011 (FAO/ILRI)



# Livestock production systems

- Mixed systems:
  - High human population densities and better market access
  - most dairy production in SSA >70%
  - 50% of the beef
  - 40% of the shoat meat production
  - Growing fastest
  - small herds
  - Constraints: farm size, soil fertility, feed sourcing, land use trade-offs, manure use

- Rangeland systems
  - Lower population densities
  - Largest area (70% of agricultural area)
  - Large herds
  - 50% of beef production and 60% of shoat production
  - Somewhat stagnating
  - Constraints: degradation, conflict, low feed availability and quality, diseases, drought

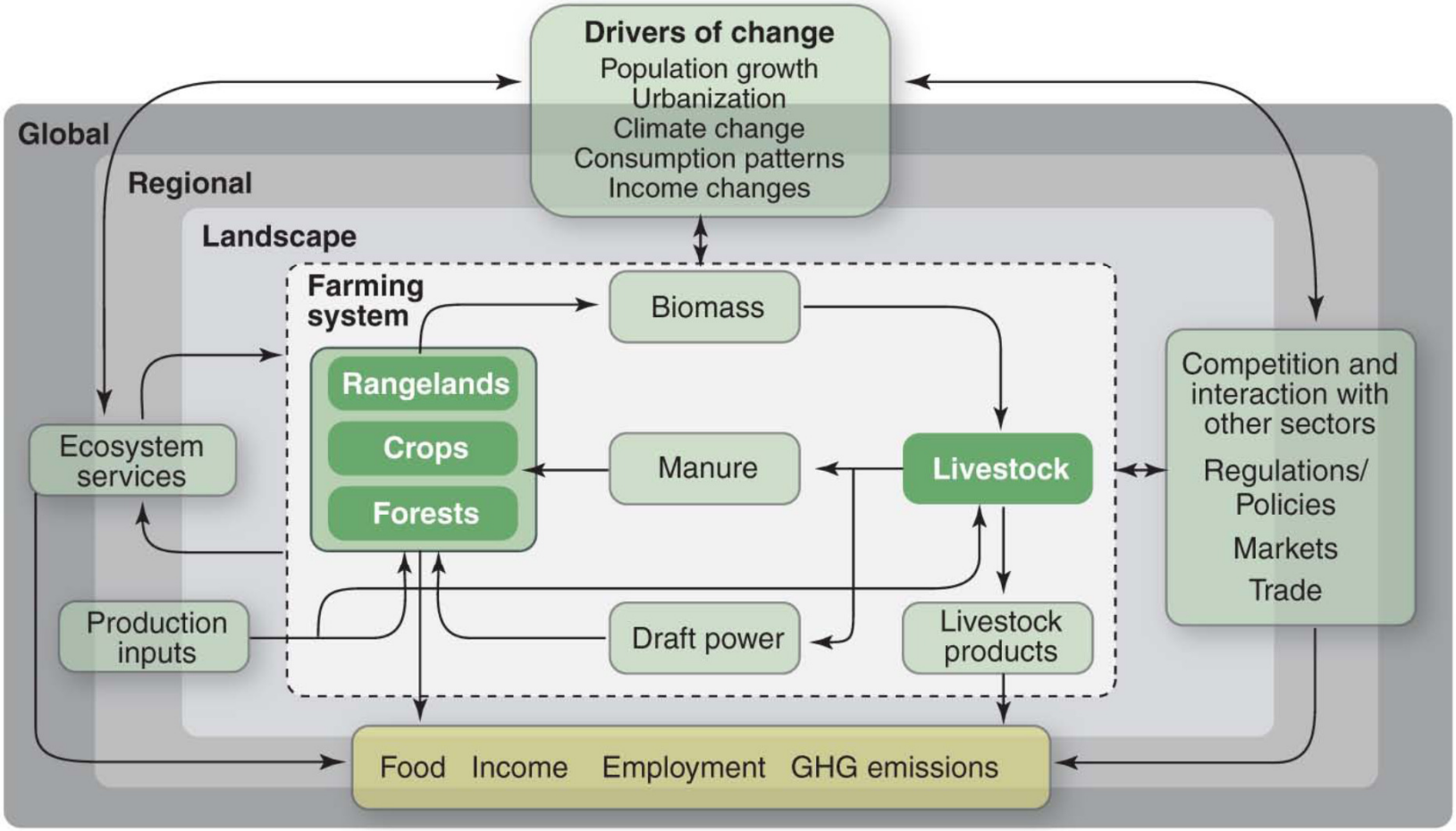
# Livestock production systems

| Systems | 2000 | | | |
|---|---|---|---|---|
| | Cattle[a] | Goats[a] | Sheep[a] | Area[a] ($km^2$) |
| Livestock grazing | | | | |
| Arid | 75.5 | 9.7 | 13.3 | 17.9 |
| Humid | 7.6 | 0.9 | 0.5 | 1.4 |
| Temperate | 4.4 | 0.3 | 0.8 | 0.3 |
| Total | 87.5 | 10.8 | 14.6 | 19.5 |
| Mixed | | | | |
| Arid | 82.6 | 7.5 | 7.8 | 3.9 |
| Humid | 15.0 | 2.5 | 1.4 | 1.4 |
| Temperate | 29.5 | 1.0 | 1.5 | 0.6 |
| Total | 127.1 | 11.0 | 10.7 | 5.9 |
| Other | 14.5 | 1.6 | 1.3 | 4.0 |
| Total Africa | 229.1 | 23.4 | 26.6 | 29.5 |

Herrero et al 2008

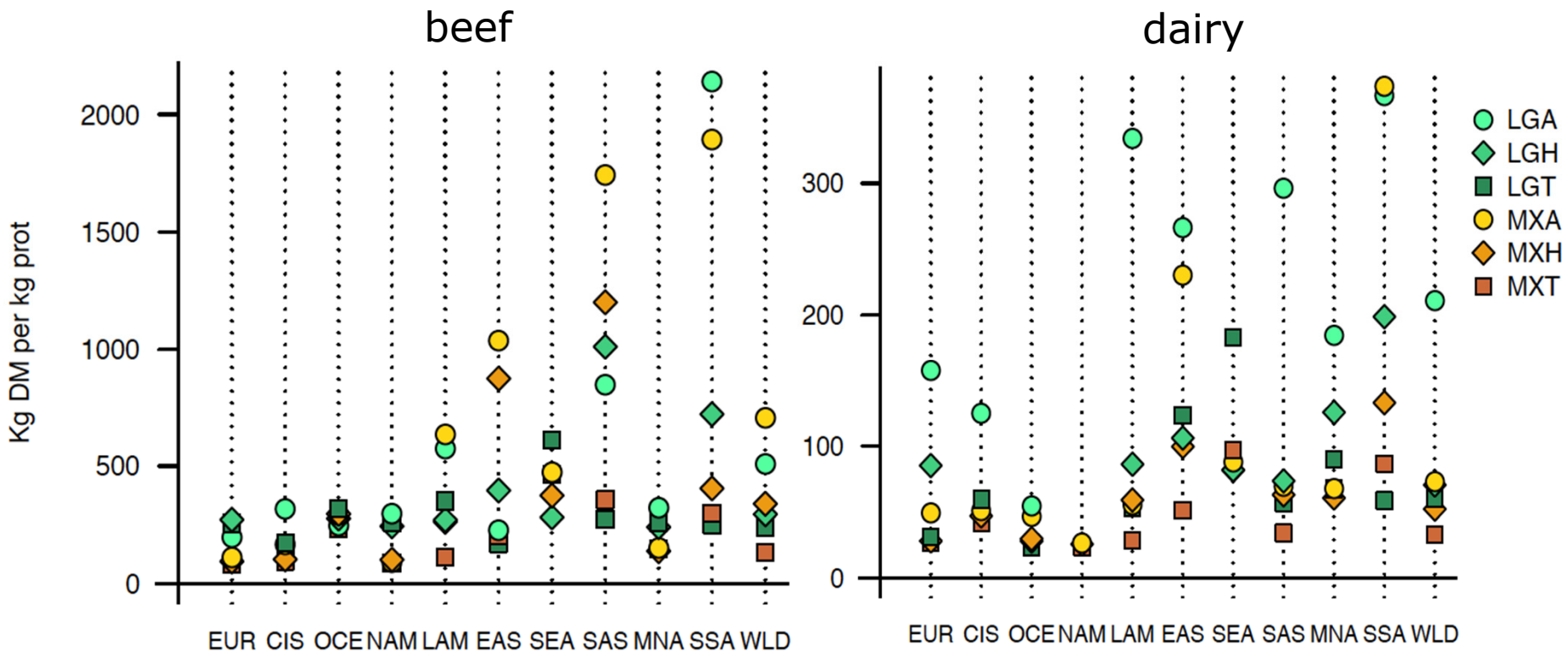
# Integrated mixed crop-livestock systems

## 60% of livestock production in SSA



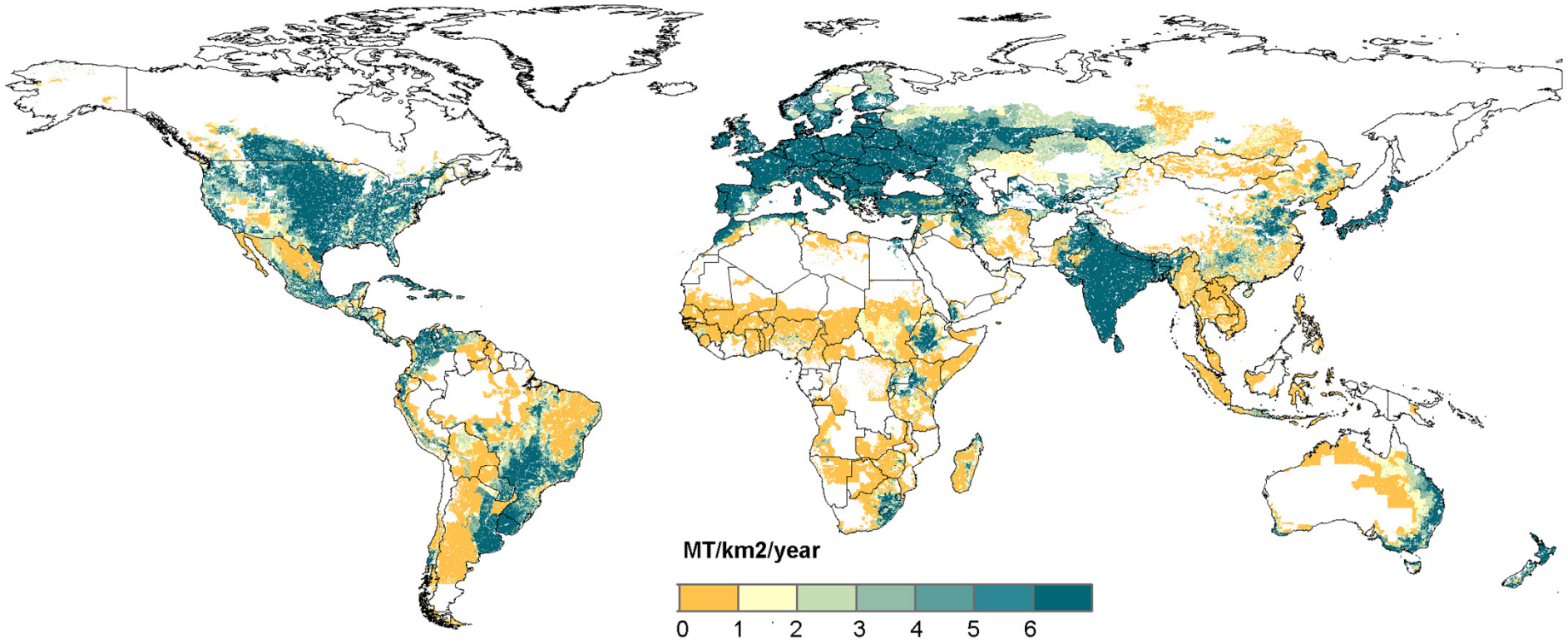

Herrero et al, Science 2010

# Feed/land use intensities: key driver for the efficiency of the livestock sector (Herrero et al. PNAS forthcoming)

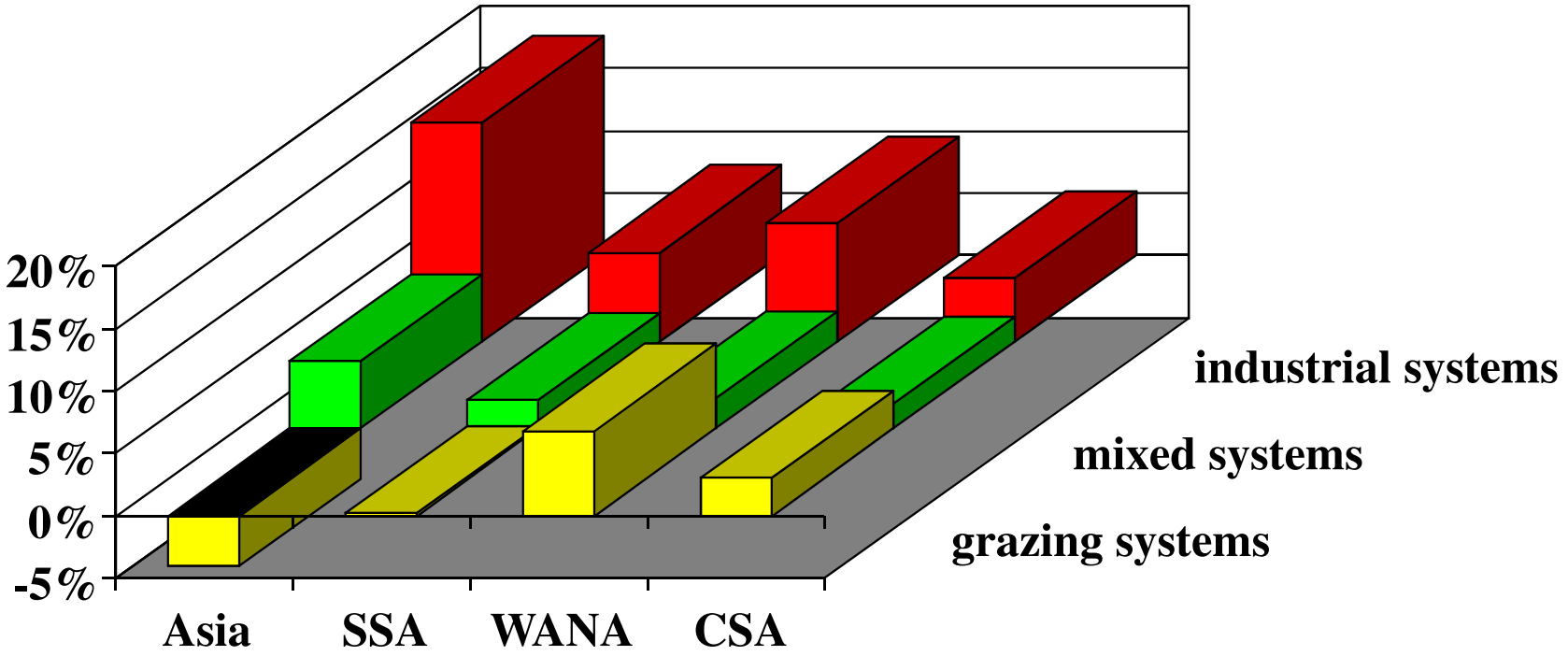



Depend on land productivity, feed quality, animal species and others

Global milk production



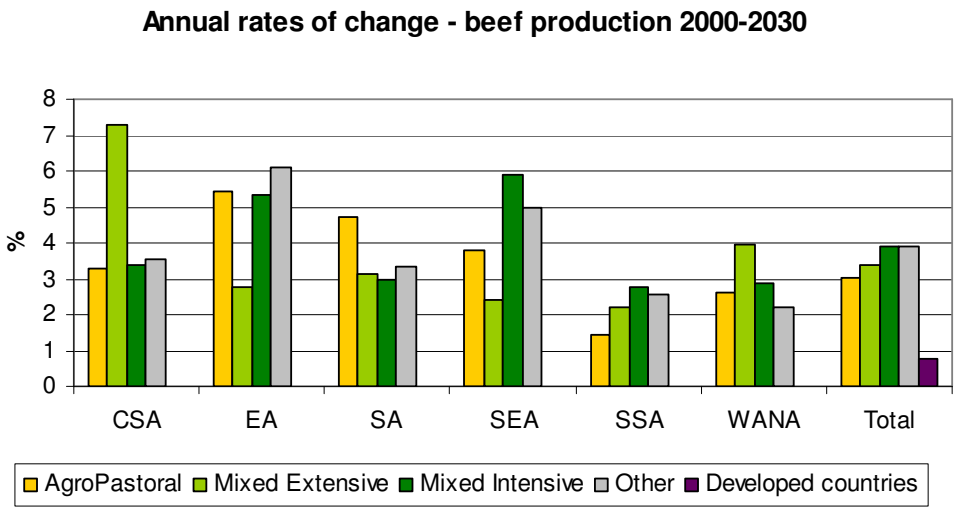
# The Livestock Revolution: Growth mainly in industrial systems




**Growth Rates (%/Y) of Meat Production in Different Production Systems in Developing Countries**

***Livestock to 2020: The Next Food Revolution*, a joint IFPRI, FAO, ILRI study.**

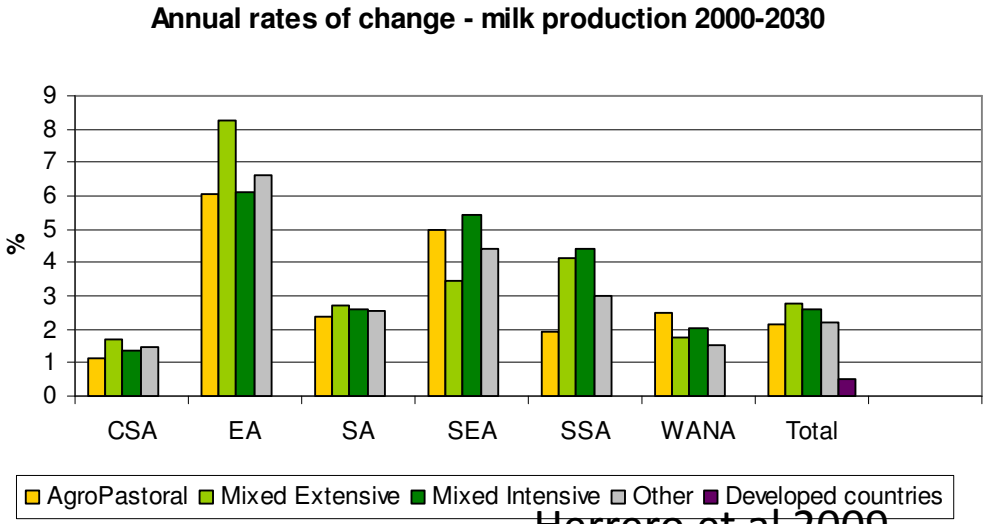
# rates of production of animal products are increasing at significantly faster rates….




Increased consumption
Increased incomes

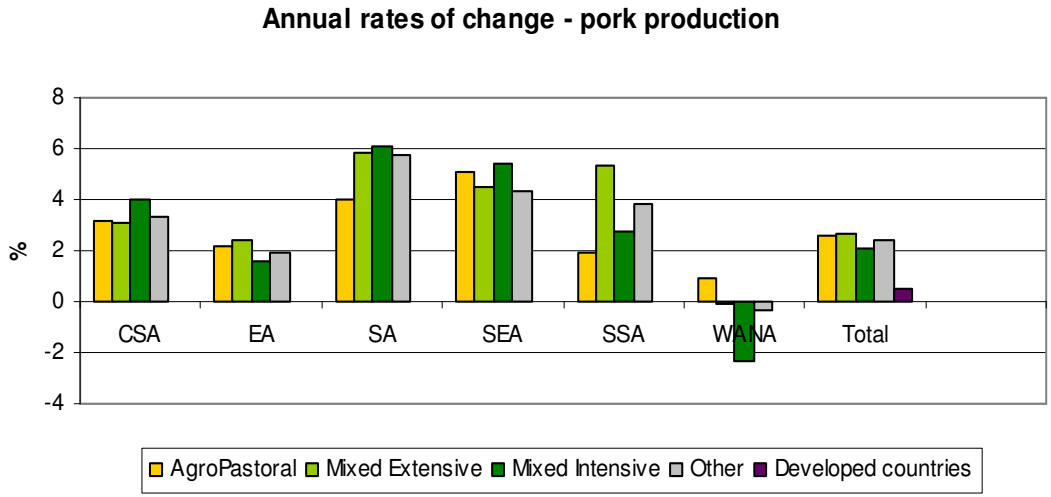
…but increased pressure on resources (land, feeds, etc)

Some industrialisation….



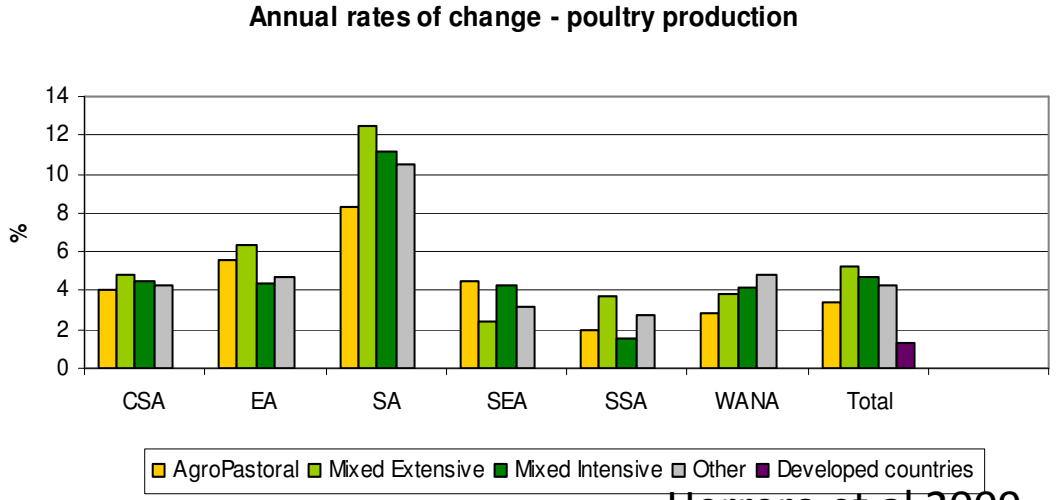

Herrero et al 2009

# rates of production of animal products are increasing at significantly faster rates….(2)




Increased consumption
Increased incomes

…but increased pressure on grains…increase in prices?



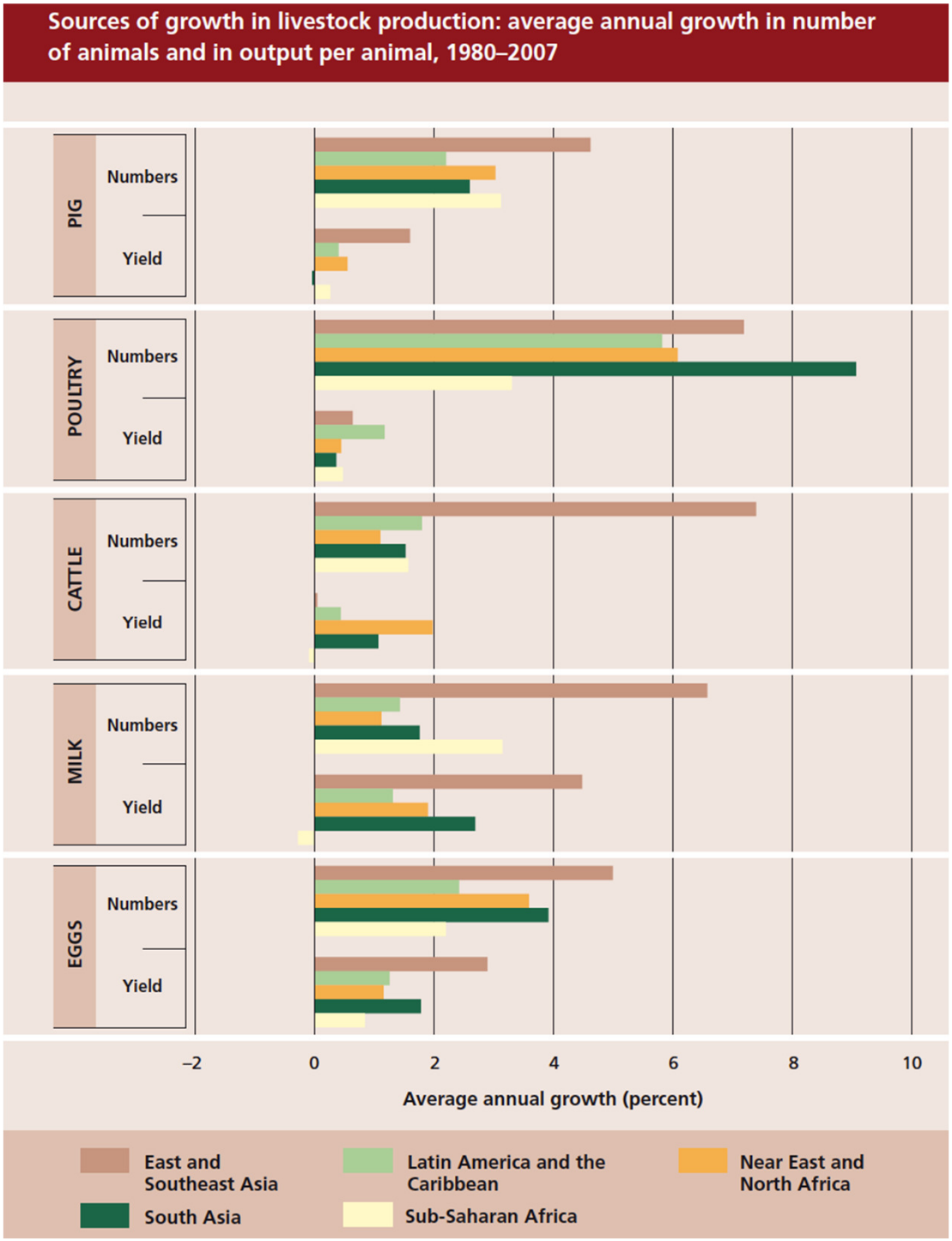

Herrero et al 2009

Most growth in production occuring due to increases in animal numbers

….rather than increases in productivity

Future resource pressures?

Need for sustainable intensification?

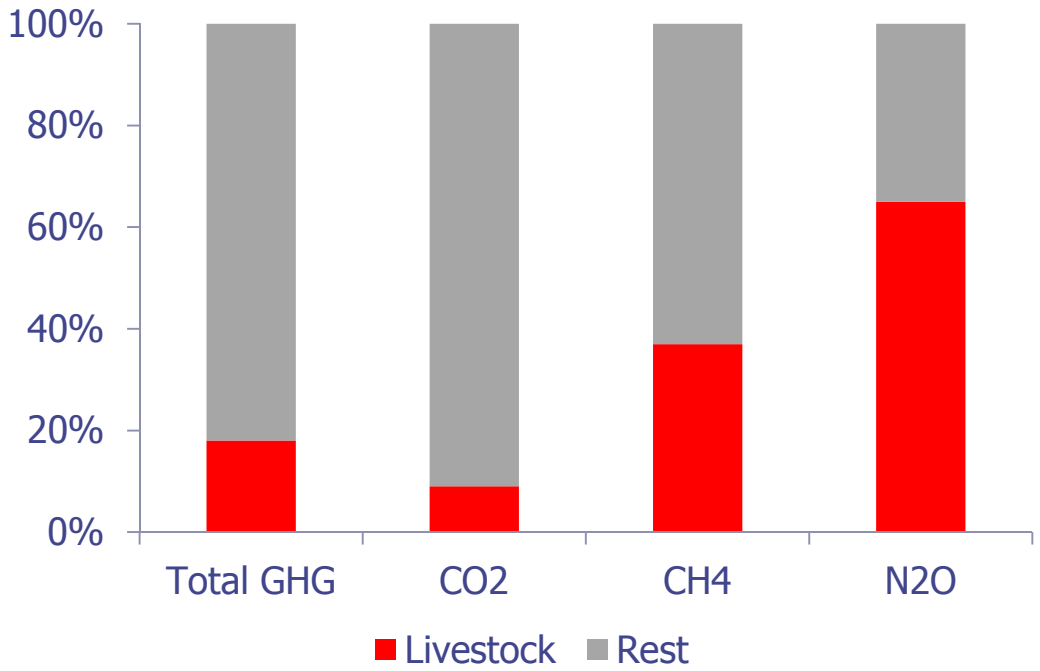



SOFA 2009

# GHG emissions

# LIVESTOCK = problem or opportunity?

Share of livestock in global GHG emissions

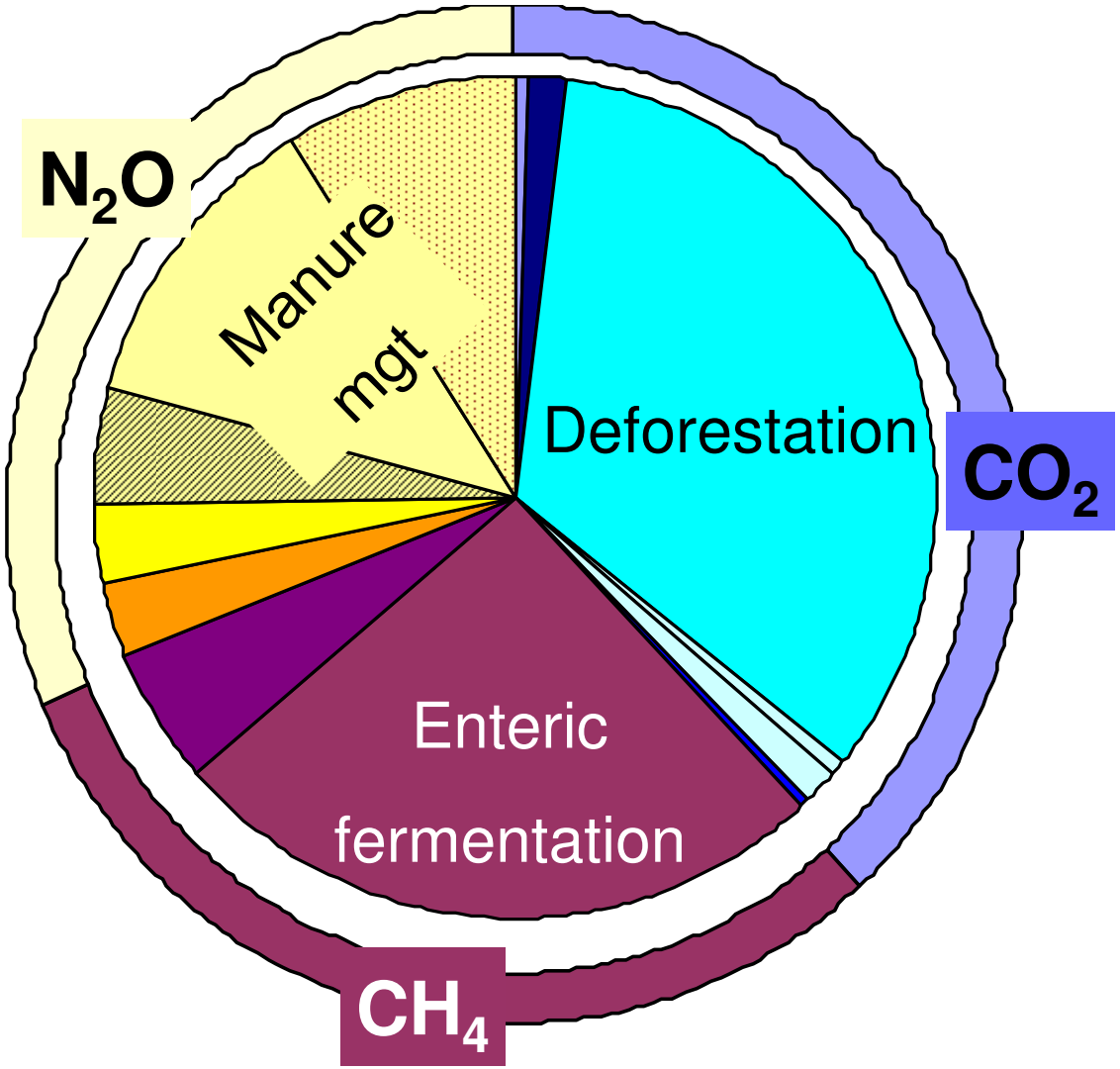



Steinfeld et al. (2006)

Livestock in the developing world have a high mitigation potential

Better feeds, breeds, management, incentives, policies and regulation

# GHG emissions from livestock (FAO 2006

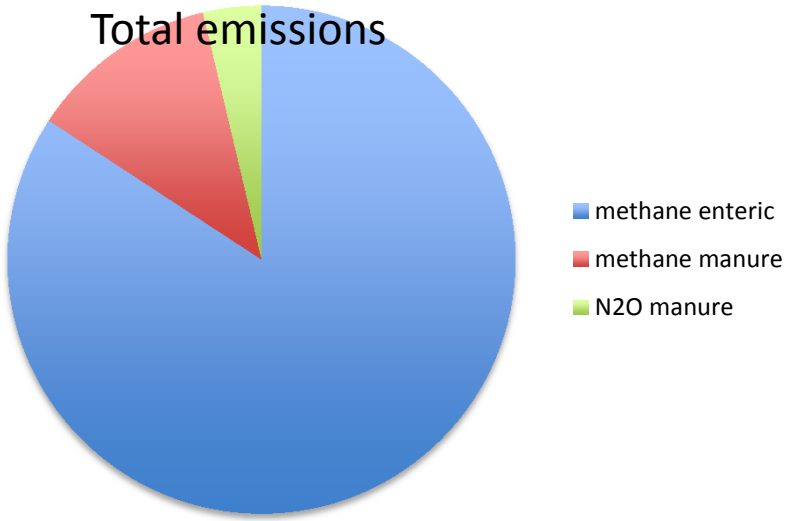


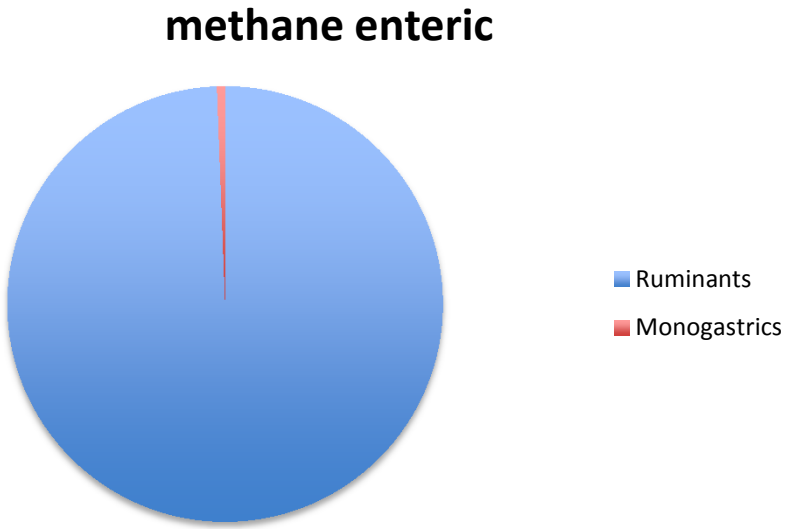

- Chemical N. fert. production
- On-farm fossil fuel
- Deforestation
- OM release from ag. soils
- Pasture degradation
- Processing fossil fuel
- Transport fossil fuel
- Enteric fermentation
- Manure storage / processing
- N fertilization
- Legume production
- Manure storage / processing
- Manure spreading / dropping
- Manu indirect emissions

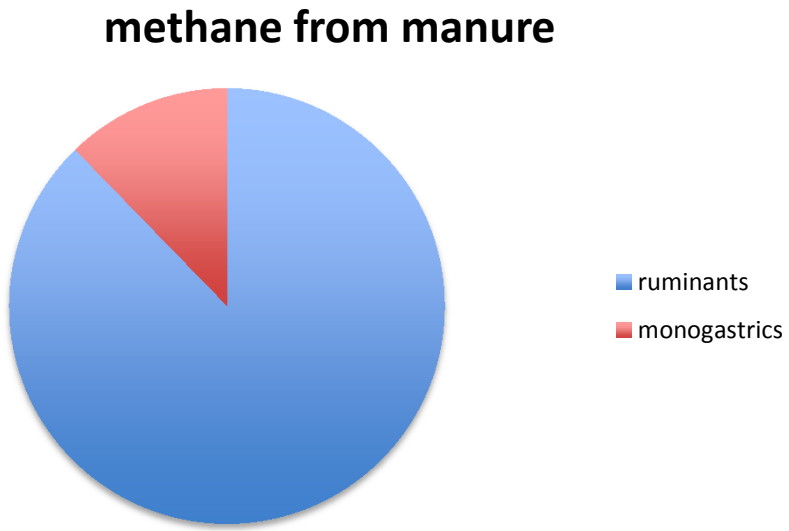
Prepared by Bonneau, 2008

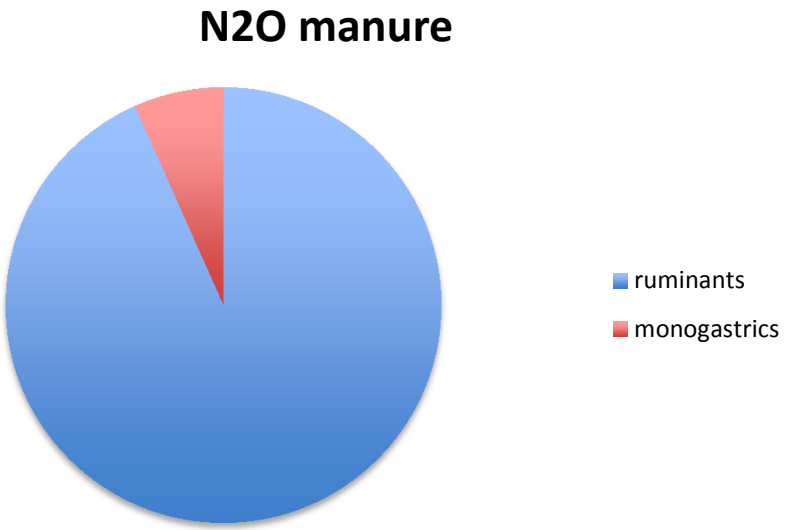
## SS Africa– Greenhouse gas emissions 2004 (Long Shadow 2006)

**Less than 15% of global livestock emissions = approx 5% global GHG emissions**



## Emissions of greenhouse gases along the animal food chain and estimated relative contribution from major species

| STEP IN ANIMAL FOOD CHAIN | ESTIMATED EMISSIONS[1] | | ESTIMATED CONTRIBUTION BY SPECIES[2] | | | |
|---|---|---|---|---|---|---|
| | | | Cattle and buffaloes | Pigs | Poultry | Small ruminants |
| | *(Gigatonnes)* | *(Percentage of total livestock sector emissions)* | | | | |
| **Land use and land-use change** | 2.50 | 36 | ■■■ | ■ | ■ | ns |
| **Feed production[3]** | 0.40 | 7 | ■ | ■■ | ■■ | ns |
| **Animal production[4]** | 1.90 | 25 | ■■■■ | ■ | ■ | ■■ |
| **Manure management** | 2.20 | 31 | ■■ | ■■■ | ns | ns |
| **Processing and transport** | 0.03 | 1 | ■ | ■ | ■■■ | ns |

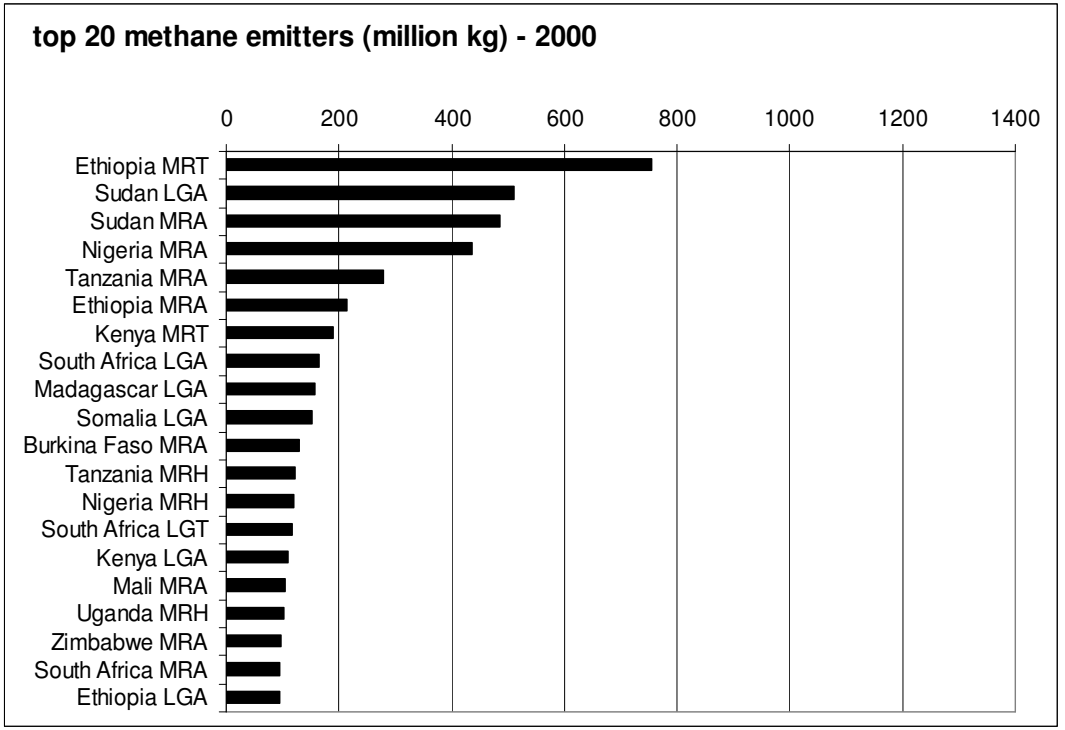
[1] Estimated quantity of emissions expressed as $CO_2$ equivalent.
[2] ■ = lowest to ■■■■ = highest.
[3] Excludes changes in soil and plant carbon stocks.
[4] Includes enteric methane, machinery and buildings.

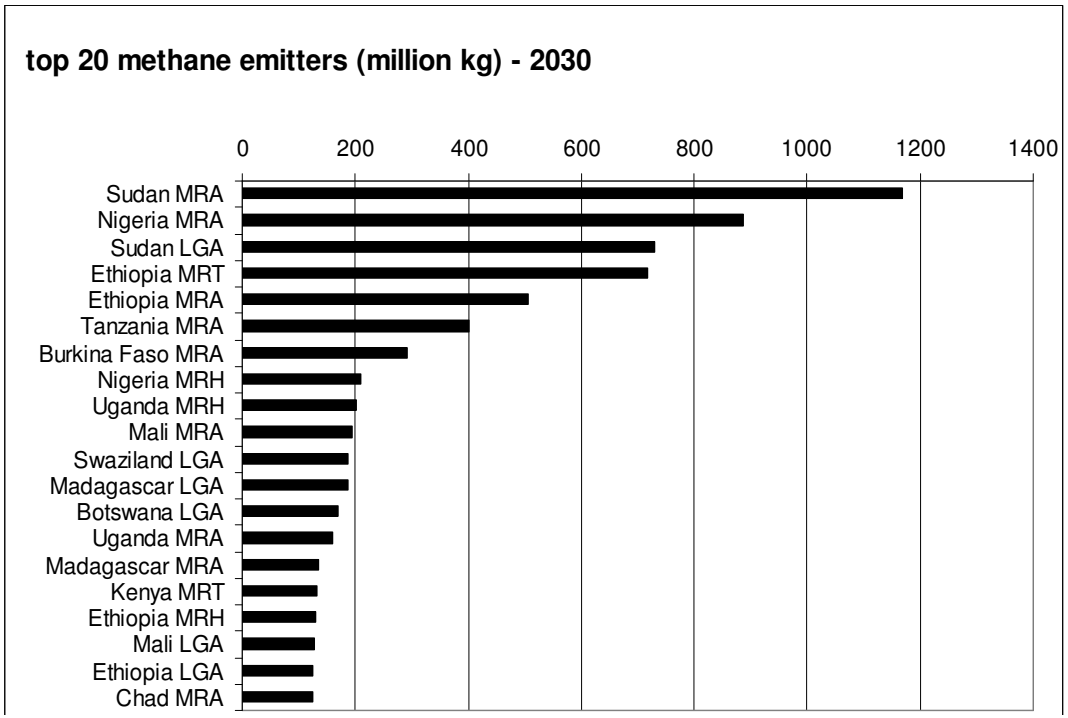
*Note:* ns = not significant.

*Source:* Adapted from Steinfeld *et al.*, 2006.

Africa - Shifts in methane production as systems evolve to 2030

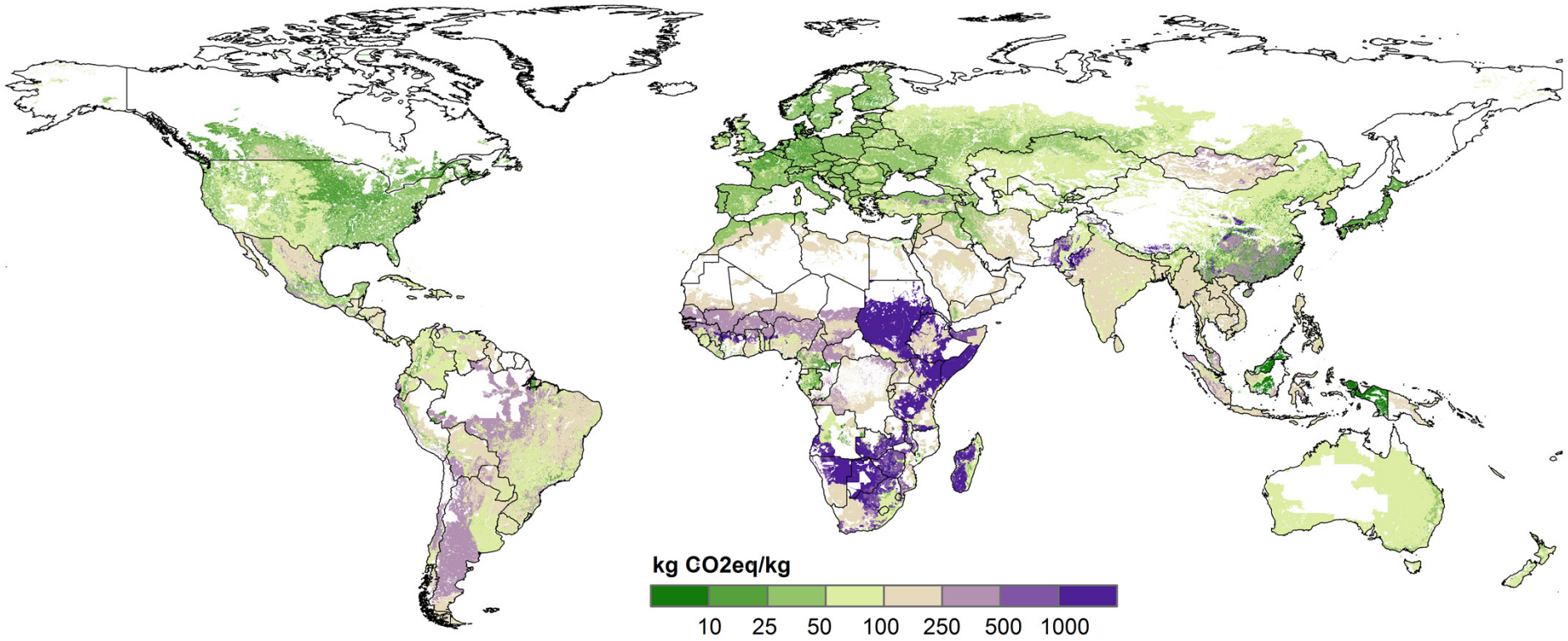
important to evaluate mitigation strategies




Herrrero et al 2008

Global greenhouse gas efficiency per kilogram of animal protein




Herrero et al (PNAS forthcoming)

# What role for rangelands?

**Largest land use system**

**Increasingly fragmented**

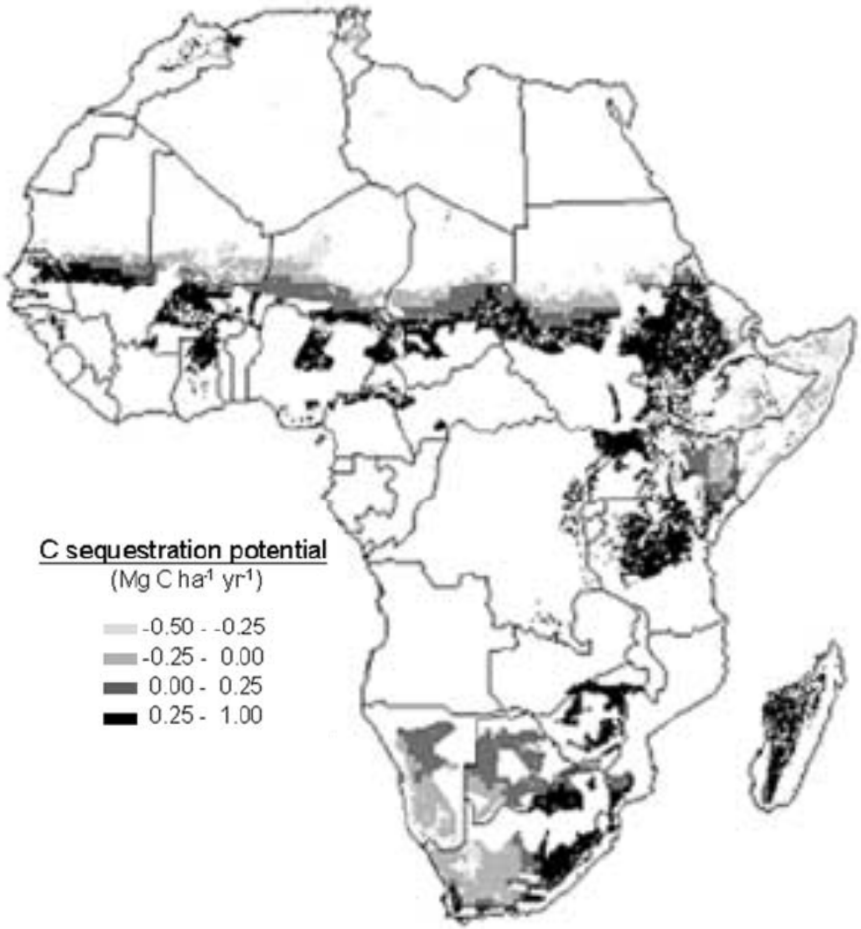
**Potentially a large C sink**

**PES: an important income diversification source**

**Difficulties in: Measuring and monitoring C stocks**

**Establishment of payment schemes**

**Dealing with mobile pastoralists**




**Potential for carbon sequestration in rangelands (Conant and Paustian 2002)**

# Conclusions

- Livestock sector in the region expected to continue to grow significantly
- Ruminants still driving production and consumption
- Currently most production is from mixed and pastoral systems
- Still main emissions coming from ruminants (ploughing, meat, milk) = methane…
- Can we sustainably intensify these mixed systems?
- Can we sequester carbon in rangelands?

Thank you